

UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL ELECTRIFICATION ADMINISTRATION
WASHINGTON 25, D. C.

October 17, 1951

TELEPHONE ENGINEERING MEMORANDUM 528

SUBJECT: Specifications for the Treatment and Inspection of Crossarms
Purchased by REA Telephone Borrowers

The attached specifications are tentative and apply to the treatment and inspection of crossarms purchased by or for REA telephone borrowers. These tentative specifications are effective immediately. Final specifications will be issued later at which time an ample period will be allowed before the effective date of the final specifications to permit suppliers to make any necessary changes.

In certain REA telephone documents the specifications for the treatment and inspection of crossarms are referred to as "Specifications for the Treatment and Inspection of Treated Timber Purchased by REA Telephone Borrowers." Such references will mean the attached specifications.

The treated products purchased by or for REA telephone borrowers shall be inspected by an inspector approved by REA and representing an inspection agency approved by REA. (See Telephone Engineering Memorandum No. 506). This entails inspection (a) before, (b) during, and (c) after treatment, making sure that every requirement of the specifications is met and making a written report to the interested parties (purchaser, contractor, and REA).

The specifications page 1 paragraph 2.1 REA Approval of Timber Products specifies that each producer who intends to furnish treated timber products for use by REA borrowers must make application and secure acceptance by REA of his products. Many producers will supply both REA telephone and electric borrowers under separate specifications calling for the same requirement. It will not be necessary for such producers to make separate applications, since one application will be sufficient.

Comments on these specifications are invited. Communications should be addressed to the Chief, Technical Standards Division, Rural Electrification Administration.

J. K. O'Shaughnessy
J. K. O'Shaughnessy, Chief
Engineering Division

Attachment

UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration
Washington 25, D. C.

TENTATIVE SPECIFICATION FOR CROSSARMS USED ON
TELEPHONE SYSTEMS OF REA BORROWERS

1.0 SCOPE

These specifications apply to treated forest products in the form of crossarms that are purchased by or for REA telephone-type borrowers. Where there is a conflict between these specifications and other specifications referred to herein, these specifications shall govern.

2.0 GENERAL STIPULATIONS

2.1 REA Approval of Timber Products

Each producer of treated timber products whose materials are intended for use by REA borrowers must make application and secure acceptance by REA of his products.

Producers who are desirous of obtaining acceptance of their products may secure information and instructions by writing the Chairman, Technical Standards Committee "A", Rural Electrification Administration, Washington 25, D. C. The names of accepted producers will be shown on the "List of Materials Acceptable For Use on Telephone Systems of REA Borrowers." This list will serve as a guide to REA borrowers in the purchase of treated timber products.

2.2 Responsibility of the Producer of Treated Timber Products

It is the primary responsibility of the producer to furnish timber products in accordance with these specifications, notwithstanding the acceptance of any certificate of inspection which may have been given.

The producer shall furnish the inspector a copy of the purchase order or contract, hereinafter referred to as the Order, pertaining to the physical requirements of the timber products, including drawing numbers constituting that respective part of the contract.

All invoices covering the billing of treated forest products supplied to a borrower, contractor, or jobber shall contain a statement certifying that the treated material listed therein has been inspected by an REA-approved inspection company or firm and meets the REA specifications.

2.3 Inspection of Treated Forest Products

The inspection of all timber products must be made by an inspection company approved by REA. Each inspection company shall submit the names of all inspectors together with the brand and

hammer number assigned to each and obtain the approval of REA before any inspection work is performed. Payment for the inspection usually will be made by the purchaser. The producer must notify REA in advance of any change that may be made in the inspection arrangement. The purchaser reserves the right to designate the inspection company from the list of approved pole inspection companies.

Arrangements may be made with an approved producer of timber products whereby such products may be treated by the producer and inspected by an inspection company prior to purchase by a contractor or an REA borrower. In such a case the inspection company's services are arranged for by the producer, with the approval of the Rural Electrification Administration, and are paid for by the producer. The producer must notify REA in Washington, D. C., in advance of any change that may be made in the inspection arrangement.

These treated forest products, after passing inspection, are designated as "Certified". Before the treatment of "Certified" treated forest products is begun at any treating plant, the prospective producer shall submit for approval the names of the inspection company's inspectors and the brand and hammer number assigned to each inspector. Such approval by REA, of course, does not create any obligation on REA or the government with respect to payment for the inspection service or the "Certified" treated forest products.

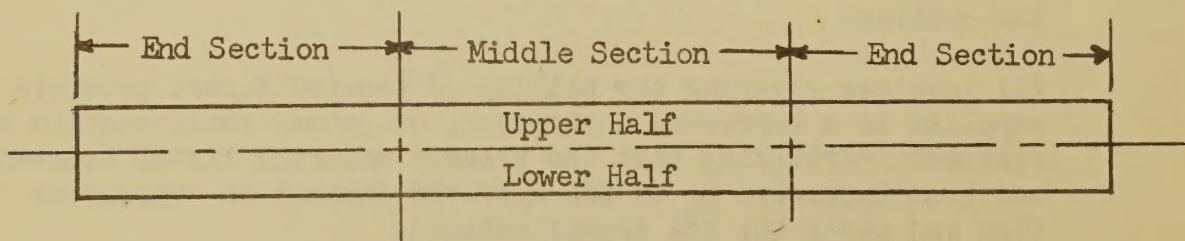
3.0 MATERIAL REQUIREMENTS

3.1 Species of Timber: Only Southern Yellow Pine and Douglas Fir timber will be used for the fabrication of crossarms.

3.2 Types: The following types of crossarms are covered by this specification:

6A (6 pin arm)
6B (6 pin arm)
10A (10 pin arm)
10B (10 pin arm)
DE (dead-end arm)

3.3 Sections: For ease of description crossarms are divided into sections as follows:



3.31 These sections are subdivided into pin-hole zones; pole bolt-hole zones; and brace bolt-hole zones. The sizes of these zones are indicated in Table 1, par. 4.34 of the Material Requirements.

3.4 Dimensions: All design dimensions and tolerances shall be in accordance with drawing #802 and #802-1, which is part of this specification.

3.5 Finish: Crossarms shall be of first quality workmanship.

3.51 Arms are to be surfaced on four sides, after seasoning. Skips up to one foot are permitted on one face, provided the cross-sectional dimensions at the skip are not less than tolerances permit.

3.52 Pin and bolt holes shall be smooth inside and not splintered deeper than 1/4 inch.

3.53 Ends shall be sawed off square.

3.54 Edges shall be chamfered in accordance with drawing #802 which is part of this specification.

4.0 MATERIAL REQUIREMENTS FOR 6A, 6B, 10A, and 10B CROSSARMS

4.1 Grade: Close grain

4.2 Prohibited Defects: The following defects are prohibited.

Brashness or light weight wood
Cross breaks (Cracks)
Decay (Dote or Rot)
Shakes
Splits
Pitch seams
Large pitch streaks
Red Heart
Pith in edge or face of arm

4.3 Limited Defects:

4.31 Checks: Through checks are prohibited. Checks on top of arm not to exceed 24 inches. Checks intersecting adjacent pin holes along the same line of grain are restricted to bottom of arm. Checks occurring within pin-hole zones shall be limited to 2 inches, and prohibited if 1 inch or longer and appearing in successive pin-hole zones.

4.32 Compression Wood: Streaks of compression wood shall not exceed 1/2 inch in width and the aggregate width of

streaks in any one piece shall not exceed one-tenth of the width of the piece. The outer three annual growth rings shall be free from compression wood.

4.33 Crossgrain: Maximum slant of grain to be 1 inch in 8 inches in the middle section, and 1 inch in 6 inches in the end sections, exclusive of variation around knots and pitch pockets.

4.34 Knots and Knot Cavities: Knot sizes and locations to be limited in accordance with Table 1.

Except for corner and spike knots, each cross-section of a knot, appearing on any surface, is considered to be a separated knot.

Spike knots may have maximum diameters as shown in Table 1 only when their lengthwise face occurs on bottom of arm. At other locations, spike knots may not exceed 1/2 the sizes shown.

No part of a knot is permitted within hole zone boundaries when its diameter is greater than that permitted within the hole zone boundaries. This limitation is also applicable to longitudinal face as well as end face or faces of spike knots.

TABLE 1

Knots - Maximum Diameters Permitted (except spike knots)

Zone Name	Width of Zone*		Maximum Single Knot Size		Sum of Diameters (Upper plus lower half)		
	Wood Pins	Steel Pins	Middle Section	End Section	Middle Section	End Section	
			Upper Half	Lower Half			
Pin Hole	1-1/4"	1"	1/2"	5/8"	1"	—	—
Pole Bolt Hole	1"	1"	1/2"	5/8"	—	—	—
Between Hole Zones	Any 4" width		1"	1-1/4"	1-1/2"	2-1/2"	3-1/2"

*When distance between centers of pin-hole and brace-bolt hole is 2 inches or less, width of zone extends to 1/2 inch beyond brace-bolt hole.

- 4.35 Knot Clusters: Prohibited in upper half of middle of arm.
- 4.36 Knot Cavities: All knot cavities shall drain water when the arm is in its installed position.
- 4.37 Loose Knots: Prohibited within hole zone boundaries.
- 4.38 Pitch Pockets: Pitch pockets over 1/4 inch in width prohibited.
- a. Top face, maximum two pockets each 1/8 inch in width by 4 inches in length or equivalent on area basis.
 - b. Sides, maximum three pockets, each 1/8 inch in width by 8 inches in length or equivalent on area basis.
 - c. Bottom, maximum three pockets, each 1/8 inch in width by 12 inches in length or equivalent on area basis.
- 4.39 Warp: Warp not to exceed 1/10 inch in 12 inches of length. Not to occur in two directions.
- 4.310 Wane: Bark to be removed from wane. Wane shall not intersect any pin holes on top of arm.

Middle Section - Maximum of 1/2 inch measured across surface.
End Section - Maximum of 1 inch measured across surface.

- 4.311 Wormholes: Not to be larger than 3/32 inch in diameter.

5.0 MATERIAL REQUIREMENTS FOR DE CROSSARMS

- 5.1 Grade: Dense
- 5.2 Defects: All defects prohibited except as herein permitted.
- 5.3 Checks: Through checks are prohibited. Only small or medium checks are permitted.
- 5.4 Pitch Pockets:

Narrow faces: Two pockets, each not over 1/4 inch in width by 2 inches in length, or equivalent area if less than 1/4 inch in width.

Wide faces: Two pockets, each not over 3/8 inch in width and not over 4 inches in length, or equivalent area if less than 3/8 inches in width.

5.5 Knots:

5.51 Prohibited: The following are prohibited

Knot clusters
Loose knots
Knot cavities

5.52 Middle Section - Spike knots prohibited. Knots in pole bolt hole zone limited to 3/8 inch, and no part of a knot exceeding this size permitted within this zone. (Width of this zone is 3 inches). Knots in other locations of middle section limited to 3/4 inch.

End Section - Spike knots not to exceed 1/2 inch and other knots not to exceed 1 inch.

5.6 Crossgrain: Maximum slant of grain to be 1 inch in 15 inches.

6.0 INSPECTION PRIOR TO TREATMENT:

On accepting crossarms preparatory to treatment, the inspector shall stamp his distinctive hammer mark on one end of each crossarm.

7.0 CONDITIONING:

Crossarms shall be conditioned according to AWP standard specifications T1 and T2 for the particular specie involved.

Conditioning shall be carried on in such a manner that it will not be injurious to the product. Crossarms shall be conditioned sufficiently so that objectional checking does not occur after treatment. (Objectional checking is that which results in the exposure of untreated wood to deteriorating organisms). It is the responsibility of the producer to insure that the crossarms shall be so conditioned as to avoid both injury to the product and objectionable checking after treatment.

8.0 TREATING PROCESS, RETENTION AND PENETRATION:

8.1 The preservative treatment of crossarms shall be by the pressure process according to AWP standard specification T1 and T2.

8.2 The retention of the preservative shall be 6 pounds per cubic foot.

8.3 For Southern Pine crossarms the preservative shall penetrate

90% of the sapwood.

- 8.4 In Douglas Fir crossarms the preservative shall penetrate the heartwood longitudinally not less than $1\frac{1}{2}$ inches from pin holes, bolt holes and from the ends.

9.0 INSPECTION AFTER TREATMENT:

9.1 Determination of Penetration of the Preservative:

Twenty (20) borer cores shall be taken from a complete charge. Borer cores shall be taken along longitudinal center line of the side of a crossarm to determine penetration according to paragraph 8.0.

9.2 Determination of Retention of the Preservative:

The retention shall be determined by the quality of preservative consumed and the volume of wood in the charge, according to the latest AWP Standard T1.

9.3 Inspectors Acceptance after Treatment:

When accepting crossarms after treatment, the inspector shall stamp his distinctive hammer mark on the end opposite that of the former inspection prior to treatment.

10.0 PRESERVATIVES:

10.1 Creosote:

"C" is the branding code designation for this preservative. This preservative shall be Grade 1 Coal-Tar Creosote and shall be in accordance with the latest AWP Standard Specification P1, "Standard Specification for Creosote."

10.11 Analysis of Creosote

The analysis shall include a determination of the specific gravity of fractions distilling between 235° and 355° C.

1. The specific gravity of fractions distilling between 235° and 315° C. shall not be lower than 1.025 @ 38° C. compared with water at 15.5° C.

2. The specific gravity of fractions distilling between 315° and 355° C. shall not be lower than 1.085 @ 38° C. compared with water at 15.5° C.

10.2 Petroleum Oil Containing 5 Percent Pentachlorophenol*

"P" is the branding code designation for this preservative. The oil used in preparing the solution shall conform to the following specifications:

10.21 Petroleum Oil (Carrier for Pentachlorophenol)

10.211 It shall be not too viscous to meet penetration requirements satisfactorily at the temperature specified in the latest applicable AWWA Standards. It shall not form objectionable sludge** when mixed and repeatedly used in the treating solution. When used with pentachlorophenol alone, it shall be dark enough in color to be readily observed in sections of borings of the treated wood.

10.212 It shall have a specific gravity of not less than 0.9041 at 15.5° C. (This corresponds to an A.P.I. gravity of not higher than 25.0 at 60°/60° F.)

10.213 It shall have a flash point of not less than 190° F., as determined by a Pensky-Martens closed tester (latest ASTM Standard D-93) or 210° F. by the Cleveland open cup method.

10.214 The Pentachlorophenol solvency of the petroleum oil shall be not less than 10 percent by weight at 75° F. when determined by the method given in the 1947 Report of AWWA Preservatives Committee referred to in 10.211 above.

10.215 The total volume of the fractions distilling below 500° F. shall be not more than 50 percent (Latest ASTM Standard D-158).

10.22 Pentachlorophenol

Pentachlorophenol shall conform to the latest Federal Specification TTW-570.

*During the limited number of years this preservative has been in commercial use, it has given favorable results but its effectiveness has not yet been fully evaluated. Methods of treatment recommended for creosote are also recommended for this preservative.

**Maximum sludge formation shall be 0.5% (sludge minus sediment) as determined by the method proposed in appendix C of Report of Committee 4 Preservatives, AWWA 1947.

11.0 DEFINITIONS:

The following definitions are a part of this specification and shall apply thereto:

11.1 Brashness: Brashness is an abnormal condition which results in sudden failure, across the grain, when the member is subjected to bending. Little or no splintering occurs at the break. Brashness is indicated by:

11.11 Exceptionally low specific gravity or weight for a given piece in a given species.

11.12 An especially small volume of summerwood.

11.13 Fibers having thin walls.

11.2 Bow: Bow is the deviation from a straight line drawn longitudinally along the face of a member, and is measured at the point of maximum deviation of the line. Short kinks are not included.

11.3 Check: A check is a separation of the wood along the grain, the greater part of which occurs across the rings of annual growth.

11.31 A through-check is one extending from one surface through the piece to the opposite surface or to an adjoining surface.

11.32 A small-check is a perceptible opening not over 4 inches long.

11.33 A medium-surface check is one not over 1/32 inch wide and not over 10 inches long.

11.4 Close Grain: Close grain lumber shall average on either one end or the other not less than 6 or more than 20 annual rings per inch, measured over a 3 inch portion of a radial line which shall be representative of the average growth on the cross-section. Pieces averaging at least 5 and more than 20 annual rings per inch are permitted if having 1/3 or more summerwood.

11.5 Compression Wood: Compression wood is an abnormal growth that often forms on the lower side of branches and of leaning trunks of coniferous trees. It is characterized by:

11.51 Wide annual growth rings, sometimes eccentric.

- 11.52 A relatively large amount of summerwood (sometimes more than 50% of the width of the annual rings in which it occurs.)
- 11.53 Excessive shrinkage lengthwise compared to normal growth wood.
- 11.54 Little contrast in color between springwood and summerwood, and with a lighter color and less dense or hornlike appearance than normal summerwood of adjacent rings.
- 11.6 Crack: (Cross Break) A crack is a break or fracture across the grain of the wood. Such breaks may be due to internal strains resulting from unequal shrinkage longitudinally or to external forces.
- 11.7 Crook: Crook is the deviation from a straight line drawn longitudinally along the edge of a member, and is measured at the point of maximum deviation from the line. Short kinks are not included.
- 11.8 Crossgrain: Crossgrain is grain that is not parallel with the axis of the piece. It may be diagonal or spiral grain or a combination of both.
- 11.9 Cup: Cup is a curve in a piece across the grain, or width of a piece. It is measured at the point of greatest deviation from a straight line drawn from edge to edge of a piece.
- 11.10 Decay: (Dote or Rot) Disintegration of the wood due to the action of wood destroying fungi.
- 11.11 Dense Grade: Dense grade stock shall have on either one end or the other not less than 6 annual rings per inch, measured on a 3 inch radial line at right angles to the annual rings, and at least 33-1/3% summerwood. A piece containing 5 annual rings per inch is acceptable if the summerwood content is 50% or more. In either case the contrast between spring and summerwood shall be distinct.
- 11.111 In boxed pith arms, the count shall be made over the whole length of a line extending from the pith center to the farthest corner.
- 11.112 In side cut arms the count shall be made over the entire length of a line, drawn perpendicular to the rings, and extending entirely across the piece.

- 11.12 Heartwood: Heartwood is the wood extending from the pith to the sapwood, and is usually darker in color than the sapwood.
- 11.13 Knots: A knot is a branch or limb that has been incorporated in the body of the tree.
- 11.131 A single knot is a knot appearing by itself with the fibers of the wood displaced around or intergrown with it.
- 11.132 A group of knots is two or more knots appearing in a particular section or zone.
- 11.133 A knot cluster is two or more knots grouped together as a unit with the fibers of the wood deflected around the entire unit.
- 11.134 A spike knot is a knot appearing on and at the intersection of two adjacent faces, and is so positioned that its length-wise axis appears in one face and does not pass into the piece.
- 11.135 A corner knot is a knot appearing on and at the intersection of two adjacent faces, and is so positioned that:
- a. its lengthwise axis or pith, goes through the corner or is absent from the piece; or
 - b. the lengthwise axis appears in only one of the faces and enters the body of the piece.
- 11.136 A decayed knot is a knot, which due to advanced decay, is not as hard as the surrounding wood.
- 11.137 An encased knot is one whose rings of annual growth are not completely intergrown with those of the surrounding wood.
- 11.138 An intergrown knot is one whose rings of annual growth are completely intergrown with those of the surrounding wood.
- 11.139 A loose knot is one that is not held firmly in place by shape, growth or position.
- 11.1310 A sound knot is one that is solid across its face and is as hard as the surrounding wood.

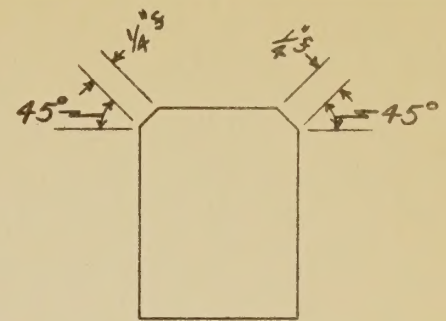
- 11.1311 An unsound knot is one that shows evidence of incipient decay.
- 11.1312 A knot cavity occurs when the knot is missing from the piece.
- 11.14 Measurement of Knots: The size of knots shall be determined to the nearest $1/16$ inch as follows:
- Spike knots: Measured across the end grain of the knot between the intersecting edge of the arm and a line parallel to the edge.
- All other knots: Across the smallest diameter.
- 11.15 Pitch Pocket: Pitch pockets are well defined openings between annual growth rings. The length shall be measured along the face in which they appear, and the width shall be measured perpendicular to the walls of the pocket.
- 11.16 Pitch Seam: A pitch seam is a shake or check which is filled with pitch.
- 11.17 Pitch Streak: A pitch streak is a well-defined accumulation of pitch in the wood cells in a more or less regular streak.
- 11.171 A small pitch streak is not over $1/12$ the width by $1/6$ the length of the surface on which it occurs.
- 11.172 A medium pitch streak is not more than $1/6$ the width by $1/3$ the length of the surface on which it occurs.
- 11.173 A large pitch streak is over $1/6$ the width by $1/3$ the length of the surface on which it occurs.
- 11.18 Pith Center: Pith is a small soft core occurring in the structural center of the log or limb.
- 11.19 Red Heart: Red heart is caused by a fungus, which occurs in the living tree. It is characterized, in the early stages of infection by a reddish or brownish color in the heartwood. In later stages, the wood disintegrates in small distinct areas that develop into white-line pockets.
- 11.20 Sapwood: Sapwood is the layer of wood next to the bark; usually lighter in color than the heartwood.

- 11.21 Shake: A shake is a lengthwise separation of the wood, which usually occurs between the rings of annual growth.
- 11.22 Skip: A skip is an area in a piece that failed to surface.
- 11.221 A slight skip is equal to the width of the piece and 6 inches in length.
- 11.222 A heavy skip is equal to the width of the piece and 12 inches in length, and not more than 1/16 inch deep.
- 11.23 Split: A split is a lengthwise separation of the wood, due to the tearing apart of the wood cells.
- 11.24 Spring Wood: Spring wood is that portion of the annual growth ring that is formed during the early part of the season's growth. It is usually less dense, lighter in color and weaker mechanically than summerwood.
- 11.25 Summerwood: Summerwood is that portion of the annual growth ring that is formed during the latter part of the yearly growth period. It is usually more dense, darker in color and stronger mechanically than springwood.
- 11.26 Wane: Wane is bark or lack of wood or bark, from any cause, on the edge or corner of a piece.
- 11.27 Warp: Warp is any variation from a true or plane surface. It includes crook, bow, twist, or cup or any combination of these.
- 11.28 Wormholes: Wormholes are small holes resulting from worms having been in the wood.

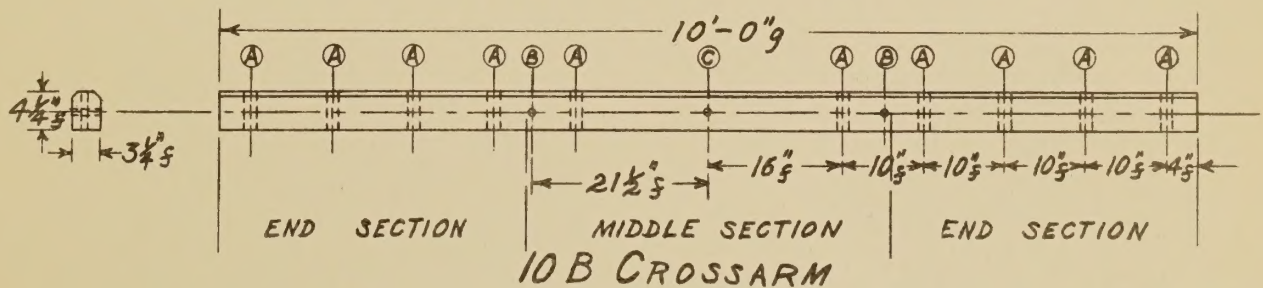
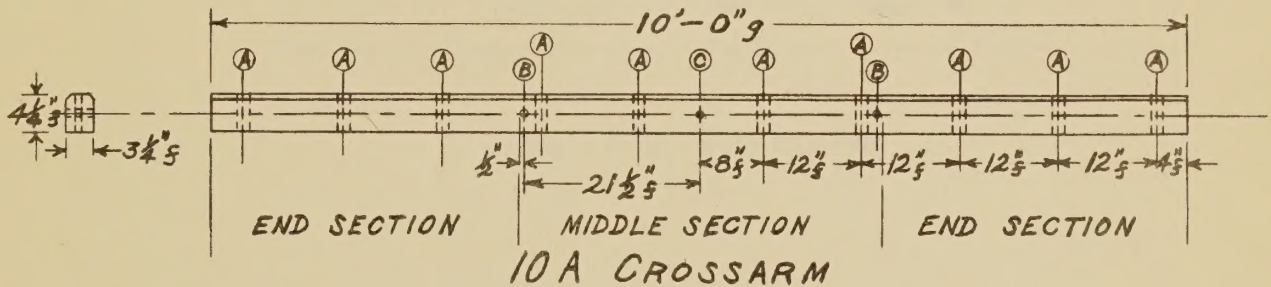
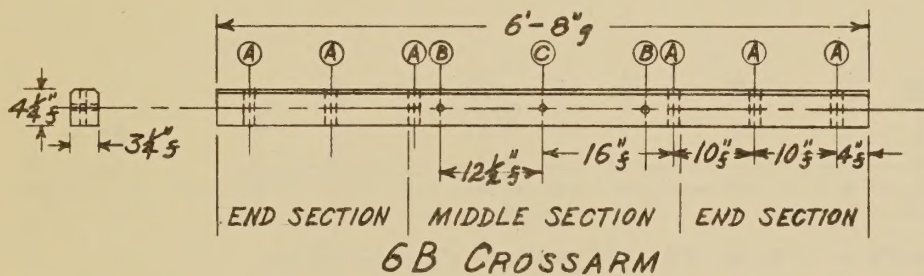
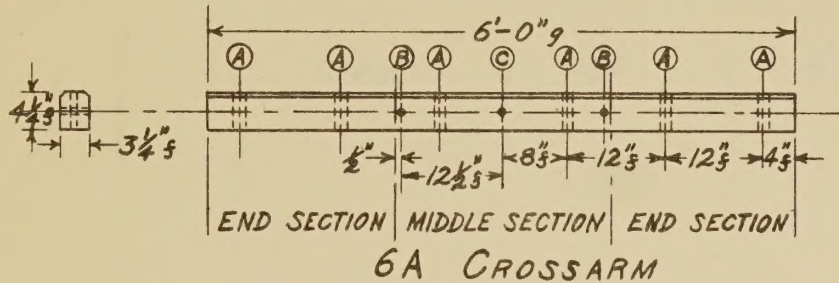
TOLERANCES
SIZES OF HOLES:

	Nominal	Go	No Go
A {	For Wood Pins $1\frac{9}{32}$ "	$1\frac{1}{4}$ "	$1\frac{11}{32}$ "
	For Steel Pins $\frac{1}{8}$ "	$\frac{5}{8}$ "	$\frac{3}{4}$ "
B	$\frac{1}{16}$ "	$\frac{3}{8}$ "	$\frac{1}{2}$ "
C	$\frac{1}{16}$ "	$\frac{5}{8}$ "	$\frac{3}{4}$ "

Others: f - $\frac{1}{8}$ " \pm g - $\frac{1}{2}$ " \pm



Typical Enlarged
Section of Crossarm



CROSSARM DRILLING GUIDE

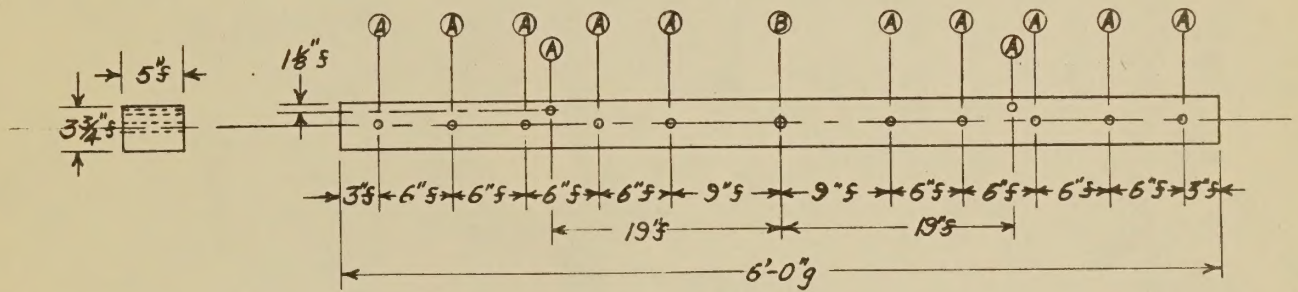
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Date: July 24, 1951
Drawing No. 802

TOLERANCES
SIZES OF HOLES:

	Nominal	Go	No Go
Ⓐ	$\frac{7}{16}$ "	$\frac{3}{8}$ "	$\frac{1}{2}$ "
Ⓑ	$\frac{1}{16}$ "	$\frac{5}{16}$ "	$\frac{3}{4}$ "

Other: 5 - $\frac{1}{8}$ " \pm 9 - $\frac{1}{2}$ " \pm



Dead-End Crossarm

CROSSARM DRILLING GUIDE

Scale: $\frac{3}{4}$ " = 1'-0"

Date: Sept. 21, 1951
Drawing No. 802-1

Library
R-1404-58

